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**INTERNATIONAL
FIELD YEAR FOR THE
GREAT LAKES**


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INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES

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UNITED STATES

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DEPARTMENT OF ENERGY, MINES
AND RESOURCES
ONTARIO MINISTRY OF THE ENVIRONMENT
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CANADA AND UNITED STATES

SEVENTEENTH CONFERENCE ON GREAT LAKES RESEARCH

Sixty-five papers on IFYGL were presented at the Seventeenth Conference on Great Lakes Research held in Hamilton, Ontario, August 12 to 14, 1974. A special volume of the Conference Proceedings containing these papers will be published by the International Association of Great Lakes Research.

SUMMARY SCIENTIFIC REPORTS

The status of the eight summary IFYGL Scientific Reports to be coauthored by Canadian and United States scientists is as follows:

Terrestrial Water Budget

Principal authors are B. DeCooke and D. Witherspoon. An acceptable outline has been prepared. Decision has not yet been made regarding contributing authors.

Lake Meteorology

This report will consist of the following three volumes, for which outlines are being prepared:

"Basin-Wide Meteorological Analysis." Principal authors: J.A.W. McCulloch and E.M. Rasmusson.

"Atmospheric Water Balance." Principal authors: H. Ferguson and E.M. Rasmusson.

"Precipitation Measurement." Principal authors: D. Pollock and J. Wilson.

Energy Balance

Principal authors are G.K. Rodgers and A.P. Pinsak, who have prepared a draft outline, which is being reviewed.

Evaporation Synthesis

An outline will be drafted when results from the Terrestrial Water Balance, Energy Balance, and Atmospheric Water Balance become available. Authors: J.A.W. McCulloch and F.H. Quinn.

Biology and Chemistry

Principal authors are W.J. Christie and N.A. Thomas. The report will consist of three volumes:

Vol. 1 - "Status of the Biota of Lake Ontario," scheduled for completion by the end of summer 1975.

Vol. 2 - "Materials Balance of Lake Ontario," to be completed by late 1975

Vol. 3 - "Results of Chemical and Biological Research," scheduled for publication in 1977.

Water Movements

Principal authors are E.B. Bennett and J.H. Saylor. An outline has been prepared and coordination with contributing authors is underway.

Atmospheric Boundary Layer

Principal authors: F.C. Elder and J.Z. Holland. A draft outline is being prepared for consideration by members of the panel.

The IFYGL Program

An outline of this report, an overall summary of the IFYGL Program coauthored by T.L. Richards and E.J. Aubert, has not yet been prepared.

IFYGL BIBLIOGRAPHY

Beginning with this issue, the IFYGL Bulletin will contain a joint Canadian-United States list of publications related to IFYGL. It will include papers published by the Canadian IFYGL Centre and the U.S. IFYGL Project Office, journal articles, and reports published under contract and by government agencies. The first edition of the bibliography appears on the following pages. Information on additional items to be included in the future should be addressed to either the Canadian or U.S. IFYGL Coordinator at the following addresses:

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Official IFYGL Publications

IFYGL Bulletin Nos. 1-12 (January 1972 to October 1974)^{1, 2}

IFYGL Technical Plan, Volumes 1-4, 1971^{1,2}

IFYGL Canadian Projects, March 1972 (series complete, 1973)²

Canadian Projects Supplement No. 1, July 1972

" " " No. 2, October 1972

" " " No. 3, February 1973

" " " No. 4, June 1973

IFYGL Technical Manuals^{1, 2}

No. 1 "Methods of Measuring Soil Moisture" by R.G. Wilson, 1972.

No. 2 "Radiation Measurement" by J. Ronald Latimer, 1972.

No. 3 "Measurement of Currents in the Great Lakes" by M.D. Palmer, 1973.

No. 4 "U.S. IFYGL Precipitation Data Acquisition System" by A.L. Hansen,
J.W. Wilson, C.F. Jenkins, and L.A. Weaver, 1973.

No. 5 "U.S. IFYGL Shipboard Data Acquisition System" by A. Robertson,
1974.

Two Nations, One Lake - Science in Support of Great Lakes Management.

Objectives and Activities of the International Field Year for the Great Lakes 1965-1973. Prepared by John O. Ludwigson for the Canadian and U.S. National Committees for the International Hydrological Decade, May 1974, 145 pp.

Proceedings, IFYGL Symposium, Fifty-Fifth Annual Meeting of the American Geophysical Union, Washington, April 8-12, 1974, August 1974, 169 pp.

¹Available in the U.S. from the
U.S. IFYGL Project Office
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²Available in Canada from the
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Atwater, M. A., "The Radiation Budget of Lake Ontario," The Center for the Environment and Man, Inc., Hartford, Connecticut.

Ball, J. T., "Cloud Analysis and Diagnosis Over Lake Ontario and Vicinity," The Center for the Environment and Man, Inc., Hartford, Connecticut.

Bannerman, R. T., and R. E. Armstrong, "Phosphorus Mobility in Lake Ontario," University of Wisconsin, Madison, Wisconsin.

Bean, B. R., C. B. Emmanuel, R. O. Gilmer, and R. E. McGavin, "On the Spatial and Temporal Variations of the Turbulent Fluxes of Heat, Momentum and Water Vapor Over Lake Ontario," Environmental Research Laboratories, NOAA, Boulder, Colorado.

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CANADA

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CANADIAN PROJECT REPORTS

- Notes: 1. Projects are numbered consecutively.
2. The letters following the number indicate which panel has prime responsibility for the project.

BC - Biology-Chemistry
 BL - Boundary Layer
 EB - Energy Budget
 ME - Lake Meteorology and Evaporation
 TW - Terrestrial Water Balance
 WM - Water Movement
 F - Feasibility

Project

1F: *Remote Sensing*

Principal Investigator: K.P.B. Thompson - CCIW

The project is complete. Three scientific papers have resulted from this project, and are listed in the IFYGL Bibliography. Two were authored by the Principal Investigator and a third is listed under R.P. Bukata.

3WM: *Statistical Prediction of Lake Currents*

Principal Investigator: H.S. Weiler - CCIW

This project has been cancelled and there will be no material submitted to the IFYGL Data Bank.

4WM: Included in Project 45WM: *Lake Current Measurements*

5BL: *Direct Measurement of Energy Fluxes*

Principal Investigator: M. Donelan - CCIW

Two papers have resulted from this project to date, and have been submitted to the Proceedings of the 17th Conference on Great Lakes Research (IAGLR). They are entitled "Wind Stress from Water Set-up" and "Generalized Profiles of Wind Speed, Temperature, and Humidity" and are listed in the Bibliography under the Principal Investigator.

8EB: *Shore Gauging Stations of Water Temperature*

Principal Investigator: D.G. Robertson - CCIW

A report on the results of the observations should be completed

by April 1975. The final report on Project 42EB by F.M. Boyce will contain a chapter on this particular project.

9EB: Included in Project 42EB:

11TW: *Monthly Water Balance of the Lake Ontario Basin*

Principal Investigator: D.F. Witherspoon - IWD, Cornwall

The calculations for this project are complete. The final report will be in the Terrestrial Water Balance Panel Report. The following is a list of scientific papers that resulted from this IFYGL project:

Witherspoon, D.F. "A Hydrologic Model of the Local Lake Ontario Basin", Technical Bulletin No. 31. Inland Waters Branch, EM&R, Ottawa, Canada, 1970.

Witherspoon, D.F. "Storage in the Water Balance of the Lake Ontario Basin", Proceedings, World Water Balance Symposium, Reading, England, 1970.

12TW: *Monthly Water Balance of Lake Ontario*

Principal Investigator: D.F. Witherspoon - IWD, Cornwall

This project is essentially complete except for the writing of the final report of the Terrestrial Water Balance Panel. The outline of the report is before the Joint Management Team for approval. Final results await radar precipitation final values for the lake. The following papers have resulted from this project:

Witherspoon, D.F. "General Water Balance of Lake Ontario and Its Local Land Basin", International Geographical Congress, Montreal, August, 1972.

Witherspoon, D.F. and B.G. DeCooke. "Preliminary Lake Ontario Water Balance During IFYGL", Proceedings, 16th Conference, Great Lakes Research (IAGLR), Sawmill Creek, Ohio, April 1973.

DeCooke, B.G. and D.F. Witherspoon. "An Estimate of the Water Balance of Lake Ontario During IFYGL", Proceedings, IFYGL Symposium, 55th Annual Meeting, American Geophysical Union, April 8-12, 1974.

13TW: *Groundwater Flow into Lake Ontario*

Principal Investigator: D.H. Lennox - IWD

This project is complete. Two publications have resulted under the authorship of C.J. Haefeli and are listed in the IFYGL Bibliography.

14TW: *Hydrology of Lake Ontario*

Principal Investigator: E.A. MacDonald - IWD

The data has been submitted to the IFYGL Data Bank and the project is now complete.

15BL: *Space Spectra in the Free Atmosphere*

Principal Investigators: G.A. McBean and E.G. Morrissey - AES

Two papers have resulted from this project to date: "On the Spectral Structure of Turbulence in the Atmospheric Edman Layer" by B.R. Kerman and "Reduction and Preliminary Analysis of Mesoscale Meteorological Data provided by NAE Low Level Research Flights in Connection with the IFYGL Program Technical Report", by D.W.B. Prentice.

16ME: *Airborne Radiation Thermometer Survey*

Principal Investigator: J.G. Irbe - AES

This project is complete. A complete report was included in IFYGL Bulletin No. 9.

18ME: *Climatological Network*

Principal Investigator: J.A.W. McCulloch - AES

This project is complete.

19ME: Included in Project 66ME.

20ME: *Bedford Tower Program*

Principal Investigator: J.A.W. McCulloch - AES

A software company has been commissioned to write the necessary program to convert from sensor output to scientific units and to apply calibration corrections. The program has been written and is in the process of being perfected. Data will then be prepared for archiving at AES.

21ME: *Canadian Shoreline Network*

Principal Investigator: J.A.W. McCulloch - AES

Preliminary tape for the first six months for all six stations will be submitted to the Data Bank by the end of January, with data for the last six months being available by the end of March.

22ME: *Synoptic Studies*

Principal Investigators: J.A.W. McCulloch and M.S. Webb - AES

Little work will be done until data are available from Canadian Shoreline stations, and U.S. towers, buoys, and shoreline stations.

23ME: *Radar Precipitation*Principal Investigator: D.M. Pollock - AES

Data for this project is presently being processed. No completion date can be given at this time.

24ME: *Climatological Studies*Principal Investigator: D.W. Phillips - AES

The IFYGL Data Bank has been provided with a complete set of six-hourly weather maps on microfilm, covering the IFYGL Data period. The paper "Climatological Weather Highlights During IFYGL" was presented at the 17th Conference on Great Lakes Research (IAGLR). The series "IFYGL Weather Data" for the Field Year is in the process of being edited and prepared for publication in an AES Technical Memorandum. For all intensive purposes, the project is complete.

25ME: *Lake Ontario Evaporation by Mass Transfer*Principal Investigator: J.G. Irbe - AES

Monthly and daily evaporation estimates have been prepared by the mass transfer method, and have been submitted to the Evaporation Synthesis Group.

26ME: *Wind and Humidity Ratios*Principal Investigator: M.S. Webb - AES

No further progress to report.

27ME: *Island Precipitation Network*Principal Investigator: J.A.W. McCulloch

The data has been published in Supplementary Precipitation, Vol. 4, No's. 2 and 3.

28BL: *Momentum, Heat, and Moisture Transfer*Principal Investigators: G.A. McBean, H.C. Martin, R.J. Polavarapu - AES

Data analysis is complete and a comprehensive data report has been submitted to the IFYGL Data Bank. The Data Report included four appendices containing wind profiles, temperature profiles, eddy fluxes of sensible and latent heat, and turbulence data. The preamble to the data report follows:

1. A.E.S. Micrometeorological Program 28-B.L. Momentum, Heat and Moisture Transfer in the Atmospheric Surface Layer Over Lake Ontario

Scientists: G.A. McBean, H.C. Martin, R.J. Polavarapu, and R.D. Paterson

a) Scientific Program

The scientific goal of the program was to investigate the transfers of momentum, heat and moisture in the atmospheric surface layer over Lake Ontario. This includes studies of the transfer mechanisms of the fluxes, the variation of the fluxes over 24 to 48 hour periods, the gradients of wind, temperature and humidity to 12 m, and the energy balance at the water surface. Parameterization of the fluxes in terms of single level observations is also being investigated.

The fluxes were measured directly by two systems; namely, the sonic anemometer - resistance thermometer - Lyman - alpha humidimeter; and sonic anemometer - thermistor - refractometer. Both on-line computation and magnetic tape recording for later digital analysis were used. Cup anemometers were used to measure the wind profile and thermocouples were used for temperature profiles between 1.0 and 12 m. Net radiation and surface water temperature were also measured.

The measurements were made from a bottom-mounted tower installed by CCIW off Niagara-on-the-Lake. The electronics and recording equipment were housed on a CCIW barge about 500 feet from the tower.

b) Review of Operations

The spring intensive period was May 1 to 14, 1972. However, because of delays in equipment and cable installation, the first data was collected on May 13. The last day of operations in the spring period was May 25. The data was collected with three separate systems. The first was wind and temperature (both dry and wet bulb) profiles which were logged on a punched paper tape system. The anemometers and thermocouples were mounted at 1, 2, 4, 8 and 11 m. The wind profile system started operating on May 13 and was in almost continuous operation until May 25. The wind profile output data are given in Appendix 1. The temperature profile system took much longer to become operational and was not functional until May 18 and then ran until May 24. The data (Appendix 2) for this period is not complete in that breaks of several hours occur randomly. The data has been analysed in 30 minute periods (32 minute periods for temperature) and the total number of data periods is 541 (270.5 hrs) of wind profiles and 235 (125 hrs) of temperature profiles.

The second system was the sonic anemometer-thermistor refractometer fluxatrons. These measured integrated latent and sensible heat fluxes over 30 minute averages. The first data was collected May 17 and observations continued until May 24. A total

of 70 periods (35 hrs) of observation were made. These were generally during the daytime. Net radiation, air temperature (10m), dewpoint (10m) wind speed (10m) and water surface temperature for each period were also observed. The fluxes as measured by this system are given as Appendix 3.

The turbulence system used a sonic anemometer-thermometer, platinum resistance thermometer and Lyman-alpha humidimeter and the data was recorded on FM analog tape. About 12 hours of data were collected during the period May 18-25 with most being collected on May 19, 20, 22. A tabulation of the data collected is given as Appendix 4. Some of the data has been digitized and the statistics computed. These are also given in Appendix 4.

The October intensive period was October 1-14. This fall intensive period was also delayed somewhat. The main problems were in the cables between the barge and the tower. These cables were laid the first week of May and by October had been severely damaged by the continual motion of the barge. For this reason the observational program in October was quite curtailed. The wind profile system was in operation almost continuously from October 5-14 but the temperature profile systems were not operated at all. The temperature system required 110 VAC to operate the aspirator motors. Unfortunately the 110 VAC power cable was broken during the summer and a replacement cable was also broken within a day of laying it at the beginning of October. The wind profile data for October is also in Appendix 1 and a total of 398 periods (199 hrs) was collected.

Through a variety of cable improvisation it was possible to operate the fluxatron systems for a total of 20 hrs on October 6, 10, 11, 12, 13 (see Appendix 3). The main trouble was with the sonic anemometer cable which had some intermittent breaks. About 5½ hours of turbulence data was collected on FM analog tape on October 10, 11, 13. For two of those hours the sonic anemometer horizontal wind channels were not working. A summary of the data collected is given in Appendix 4.

c) Summary of Progress and Future Plans

The data from the fluxatron systems has all been analysed and papers based on it were presented by H.C. Martin at the IFYGL Symposium at the Great Lakes Research Conference and at the National Congress of the Canadian Meteorological Society, Halifax, May 30 to June 1.

The profile data has undergone the initial analysis stage (as seen in Appendices 1 and 2) and will be further analysed as per the scientific program in the next year.

29BL: *Space and Time Spectra*

Principal Investigators: F.B. Muller and C.D. Holtz - AES

Data for the synoptic network has been provided to the IFYGL Data Bank. Additional data from the meso-scale network are held by the Principal Investigators.

30F: *CCGS Porte Dauphine - IFYGL Operations*

Principal Investigator: G.K. Rodgers - CCIW

Completed.

32EB: *Thermal Bar Study*

Principal Investigator: G.K. Rodgers - CCIW

Further progress is not likely until the results of the study regarding the heat content change of Lake Ontario are made available.

34WM: *Circulation Near Toronto*

Principal Investigator: G.K. Rodgers - CCIW

Data are still in the process of analysis.

36EB: *Electronic Bathythermograph*

Principal Investigator: G.K. Rodgers - CCIW

This project is complete.

38TW: *Groundwater*

Principal Investigator: R.C. Ostry - OME

No further progress to report. See Bulletin No. 11 for the last detailed report.

40WM: *Coastal Chain Study*

Principal Investigator: G.T. Csanady - University of Waterloo

Completed.

42EB: *Heat Storage of Lake Ontario*

Principal Investigator: F.M. Boyce - CCIW

Final report on this project is being prepared.

43EB: *Internal Wave Measurements*

Principal Investigator: F.M. Boyce - CCIW

Final report is being prepared.

44BL: *Analysis of Energy Fluxes*Principal Investigator: F.C. Elder - CCIW

This project is complete. The paper "Preliminary Energy Balance of Lake Ontario for the period May through November 1972" was presented at the 17th Conference on Great Lakes Research (IAGLR).

45WM: *Lake Current Measurements*Principal Investigator: E.B. Bennett - CCIW

There is no further progress to report beyond that outlined in the paper "IFYGL Water Movement Program" co-authored by E.B. Bennett and J.H. Saylor. This paper was published in Proceedings, IFYGL Symposium, 55th Annual Meeting of the American Geophysical Union, Washington, D.C., April, 1974.

46TW: *St. Lawrence-Niagara River Measuring Program*Principal Investigator: E.A. MacDonald - IWD

No report available.

47TW: *Computer Modelling*Principal Investigator: L.E. Jones - University of Toronto

No report available.

49TW: *Snow Stratigraphy and Distribution*Principal Investigator: W.P. Adams - Trent University

No report available.

54BC: *Groundwater Supply Near Kingston*Principal Investigator: W.A. Gorman - Queen's University

One paper has resulted from this project which is now complete. The paper entitled "Geochemistry of Deadman Bay Near Kingston, Ont" was prepared by L.M. Johnston as a M.Sc. Thesis.

55EB: Included in 32EB.

62ME: *Evaporation Synthesis*Principal Investigator: J.A.W. McCulloch - AES

A meeting of the Evaporation Synthesis Group was held on November 25th in Windsor, Ontario. Preliminary results in the various evaporation projects were presented and the future activities of the synthesis

group were discussed. Indications were that little progress could be made by the group for another year, until some of the evaporation studies were nearer completion.

63EB: *Airborne Ice Reconnaissance*

Principal Investigator: T.B. Kilpatrick - AES

This project is complete. A detailed report of the project's activities was included in Bulletin No. 9.

64ME: *Basin Evapotranspiration*

Principal Investigator: H.L. Ferguson - AES

A comprehensive report on this project was included in Bulletin No. 12. Two papers have resulted to date: "The Atmospheric Budgets Program of IFYGL" by E.M. Rasmusson, H.L. Ferguson, J. Sullivan and G. den Hartog; and "A Spectral Investigation of Horizontal Moisture Flux in the Troposphere" by A.D.J. O'Neill and H.L. Ferguson. Both publications are listed in the Bibliography.

65ME: *Special Shoreline Evaporation Pan Network*

Principal Investigator: J.A.W. McCulloch - AES

The data collection is complete, and the data are now being processed by the United States Office of Hydrology, with further progress pending the availability of dew-point data from the U.S. shoreline network.

66ME: *Atmospheric Water Balance Study*

Principal Investigator: H.L. Ferguson - AES

This project is now complete. A status report was presented in Bulletin No. 12, the abstract of a paper "Monthly Evapotranspiration Estimates for the Canadian Land Portion of the Lake Ontario Basin During IFYGL" by H.L. Ferguson and W.D. Hogg.

67ME: *Surface Water Temperature Distribution*

Principal Investigator: M.S. Webb - AES

A status report on this project was presented in Bulletin No. 12. A more comprehensive report will be prepared.

68F: *CCIW Supporting Resources*

Principal Investigator: J.P. Bruce - CCIW

Continues.

69TW: *Pleistocene Mapping*

Principal Investigator: E.P. Henderson - GSC

No report available.

70WM: *Ground Truth for Remote Sensing*

Principal Investigator: A. Falconer - University of Guelph

No report available. See Bulletin No. 10 for last report.

71EB: *Canadian Radiation Network*

Principal Investigator: J.A.W. McCulloch - AES

Complete. The final report on this project is entitled "Canadian Radiation Balance for Lake Ontario During IFYGL" by J.A. Davies and W.M. Schertzer.

72EB: *Floating Ice Research*

Principal Investigator: R.O. Ramseier - DOE, Ice

Two papers have resulted from this project; "Studies on the Extension of Winter Navigation on the St. Lawrence River" by R.O. Ramseier and D. Dickins, and "Navigation Season Extension Studies, Gulf of St. Lawrence to Great Lakes, Winter 1972-73", by D. Dickins.

73EB: *Terrestrial Heat Flow*

Principal Investigator: A. Judge - EM&R

Last reported in Bulletin No. 10.

74TW: *Water Level Network*

Principal Investigator: G.C. Dohler

An extensive report was included in Bulletin No. 12.

75BL: *Wind and Temperature Fluctuations*

Principal Investigators: S.D. Smith and E.C. Banks - Bedford Institute

This project was completed with the publication of: "Eddy Flux Measurements Over Lake Ontario" by S.D. Smith, Boundary Layer Meteorology, Vol. 6, pp. 235-255. Some additional comparison work may be undertaken when Niagara Bar data from Donelan (CCIW) and McBean (AES) are available.

76WM: *Surface Wave Studies*

Principal Investigator: G.L. Holland - MSD

No report available.

78TW: *Basin Water Balance*

Principal Investigator: M. Sanderson - University of Windsor

This project has been cancelled.

79F: *Bathymetric Surveys of Lake Ontario*

Principal Investigator: T.D.W. McCulloch - CCIW

This project is complete.

80EB: *IFYGL Radiation Balance Program*

Principal Investigator: J.A. Davies - McMaster University

This project was completed with the publication of "Canadian Radiation Measurements and Surface Radiation Balance Estimates for Lake Ontario During IFYGL" by J.A. Davies and W.M. Schertzer. All data measurements have been submitted to the Data Bank.

81BC: *Materials Balance - Lake Ontario*

Principal Investigator: S. Salbach - OME

A comprehensive report was included in Bulletin No. 12.

82BC: *Lake Ontario Zooplankton Migration*

Principal Investigator: J.C. Roff - University of Guelph

Last reported in Bulletin No. 9. One paper, "Energetics of Vertical Migration in Mysis relicta Loven 1862" by J.B. Foulds, has resulted from this project.

83BC: *Cooperative Studies of Fish Stocks*

Principal Investigator: W.J. Christie - OMNR

Last reported in Bulletin No. 12.

84BC: *Cladophora Growth*

Principal Investigator: G.E. Owen - OME

Data gathered during the Field Year are in the form of imagery. Little progress has been made to date in data extraction from the

imagery, but work will get underway this winter. All data and results will be presented in the final report on this project to be completed by summer 1975.

85BC: *Nutrient Cycles - Lake Ontario*

Principal Investigator: A.S. Fraser - CCIW

A paper dealing with this project is in the final phase of preparation.

87EB: Included in Project 42EB

89WM: *Turbulent Diffusion Studies*

Principal Investigator: C.R. Murthy - CCIW

The scientific papers listed below have resulted from this project. For an extensive report, see Bulletin No. 11.

1. "Horizontal Diffusion in Lake Currents" 1973. Proc. Int. Symp. on Hydrology of Lakes, Helsinki. pp. 327-344 (C.R. Murthy).
2. "An Experimental Study of Diffusion Characteristics in the Thermocline and Hypolimnion Regions of Lake Ontario" 1973. Proc. 16th Conf. Great Lakes Res. IAGLR. pp. 774-790 (G. Kullenberg, C.R. Murthy, H. Westerberg).
3. "Vertical Mixing Characteristics in the Thermocline and Hypolimnion Regions of Lake Ontario" 1974. Proc. 17th Conf. Great Lakes Res. IAGLR (to appear) (G. Kullenberg, C.R. Murthy, H. Westerberg).
4. "Dispersion of Floatables in Lake Currents" 1975. Accepted for Journal of Physical Oceanography (to appear in Vol. 1, No. 5) (C.R. Murthy).
5. "Simulated Outfall Diffusion Experiments in Coastal Currents of a Lake" 1974. Water Research, Vol. 8 (C.R. Murthy).
6. "Large Scale Diffusion Studies" 1974. CCIW Paper No. 14. (C.R. Murthy, G. Kullenberg, H. Westerberg, and K.C. Miners).
7. "Observations of Lateral Shear in the Nearshore Zone of a Great Lake" 1974. J. Physical Oceanography, Vol. 4, No. 4. pp. 660-663. (C.R. Murthy and J.O. Blanton).

90WM: Included in Project 89WM:

94: *Data Retransmission by Satellite*

Principal Investigator: H. MacPhail - CCIW

The final report on this project is completed, and is entitled "Data Retransmission via satellite, Field Year 1972" authored by the Principal Investigator.

95WM: *Hydrodynamic Modelling*

Principal Investigator: T.J. Simons - CCIW

For a complete report, see Bulletin No. 12. There were seven scientific papers resulting from this project, and are listed in the Bibliography under the name of the Principal Investigator.

96WM: Included in Project 45WM.

97BL: *Meteorological Buoy Measurements*

Principal Investigator: F.C. Elder - CCIW

This project is complete and all data has been submitted to the Data Bank.

98BC: *Lake Ontario Cross Section Study*

Principal Investigator: M. Munawar - CCIW

A paper resulting from this project was presented at the 17th Conference on Great Lakes Research (IAGLR) 1974, entitled "Phytoplankton Biomass, Its Species Composition and Primary Production at a Nearshore and Midlake Station of Lake Ontario During IFYGL", by M. Munawar, P. Stadelmann and I.F. Munawar.

101BC: *Lake Ontario Primary Production Study*

Principal Investigators: M. Munawar and J.E. Moore

The project has been completed. The last report was given in Bulletin No. 12.

102BC: *Lake Ontario Diel Pigment Variation*

Principal Investigators: W. Glooschenko and M. Munawar - CCIW

This project is complete. The abstract of the final paper was included in Bulletin No. 12.

103BC: *Pesticide Concentration in Bird's Eggs*

Principal Investigator: M. Gilbertson - CWS

The project is progressing well. Four papers have resulted to date:

1. Gilbertson, M. "Pollutants in Breeding Herring Gulls in the Lower Great Lakes". Canadian Field Naturalist, Vol. 88, 1974, pp. 273-280.
2. Gilbertson, M. and R. Hale. "Early Embryonic Mortality in a Herring Gull Colony in Lake Ontario". Canadian Field Naturalist, Vol. 88, 1974, pp. 354-356.
3. Gilbertson, M. and R. Itale. "Characteristics of the Breeding Gull Colony in Lake Ontario". Canadian Field Naturalist, Vol. 88, 1974, pp. 356 -
4. Gilbertson, M. "Seasonal Changes in Organic Chloride Compounds and Mercury in Common Terms of Hamilton Harbour Ont". To be published in: Bulletin of Environmental Contamination and Toxicology.

104BC: *Rain Quality Monitoring*

Principal Investigator: M. Shiomi - CCIW

No report available. See Bulletin No. 9 for last complete report.

107BL: *Air Pollution Sinks*

Principal Investigator: D.M. Whelpdale - AES

This project is complete. Two publications have resulted: "Sulphur Dioxide Removal by Turbulent Transfer over Grass, Snow and Water Surfaces" by D.M. Whelpdale and R.W. Shaw; and "Sulphate Deposition by Precipitation into Lake Ontario" by R.W. Shaw and D.M. Whelpdale. Both are listed in the IFYGL Bibliography.

108BL: *Lake Level Transfer*

Principal Investigator: G.C. Dohler - MSD

This project is complete.

109WM: *Upwelling Study*

Principal Investigator: G.K. Rodgers - CCIW

No further progress to report.

110WM: *Hydro Intake Study*

Principal Investigator: A. Arajs - OH

This project was completed with the paper "Nearshore Currents and Water Temperatures Along the North Shore of Lake Ontario Between Pickering and Cobourg" by A.A. Arajs and R. Farouki.

111WM: *Lakeview Dispersion Study*Principal Investigator: M.D. Palmer - OME

This project is complete, and all the data have been submitted to the IFYGL Data Bank.

112BC: *Threespine Stickleback*Principal Investigator: E.T. Garside - Dalhousie University

No report available. Last reported in Bulletin No. 9.

114WM: Included in Project 89WM.

115WM: *Wave Climatology*Principal Investigator: H.K. Cho - CCIW

No report available. The last extensive report can be found in Bulletin No. 10.

116TW: *Airborne Gamma Ray Snow Survey*Principal Investigator: H.S. Loijens - IWD, Glaciology

The project was last reported in Bulletin No. 9. The project has been terminated; however, research in the use of natural gamma radiation for snow-water equivalent and soil moisture determination is continuing.

117ME: *APT Photographs*Principal Investigator: J.A.W. McCulloch - AES

This project is now completed. The microfilm is on file at the IFYGL Data Bank.

118: *Canadian IFYGL Data Bank*Principal Investigator: J. Byron - CCIW

Cat. No. 3-118-029	Catalogue of IFYGL Data
Cat. No. 3-118-030	IFYGL Bulletin No. 11
Cat. No. 3-118-031	Two Nations, One Lake - Science in Support of Great Lakes Management - J.O. Ludwigson.
Cat. No. 3-118-032	Proceedings, IFYGL Symposium, 55th Annual Meeting of the American Geophysical Union April 8-12, 1974.
Cat. No. 3-118-033	First Annual Reports of the EPA IFYGL Projects.

Cat. No. 30118-034

Results of Intercomparison Flights
Between the NAE-T-33 and the NCAR
Buffalo Atmospheric Research
Aircraft. J.I. MacPherson.

UNITED STATES

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COMMENTS BY THE U.S. DIRECTOR

This issue covers primarily IFYGL activities from July 1 through September 30, 1974 (fig. 1), but some later work is also discussed.

A major event during this period was the Seventeenth Conference on Great Lakes Research in Hamilton, Ontario, August 12 to 14, sponsored by the International Association of Great Lakes Research. A total of 45 papers were presented by United States scientists or jointly with Canadian scientists.

The data management section of this Bulletin covers the status of processing and archival of the U.S. data sets. It contains an updated tabulated summary of data currently available, including name of investigator, description of data, and the form in which these data are archived.

While considerable progress has been made in building the IFYGL Archive, scientific analyses will continue for several years. Attention is currently focused on planning for the end products of IFYGL--the international Scientific Report series. Details are being worked out for publication of six of the eight reports to be published between 1975 and 1977. Some preliminary discussions have been held concerning a final IFYGL Symposium to serve as a forum for summarizing the most significant results of the international research program.

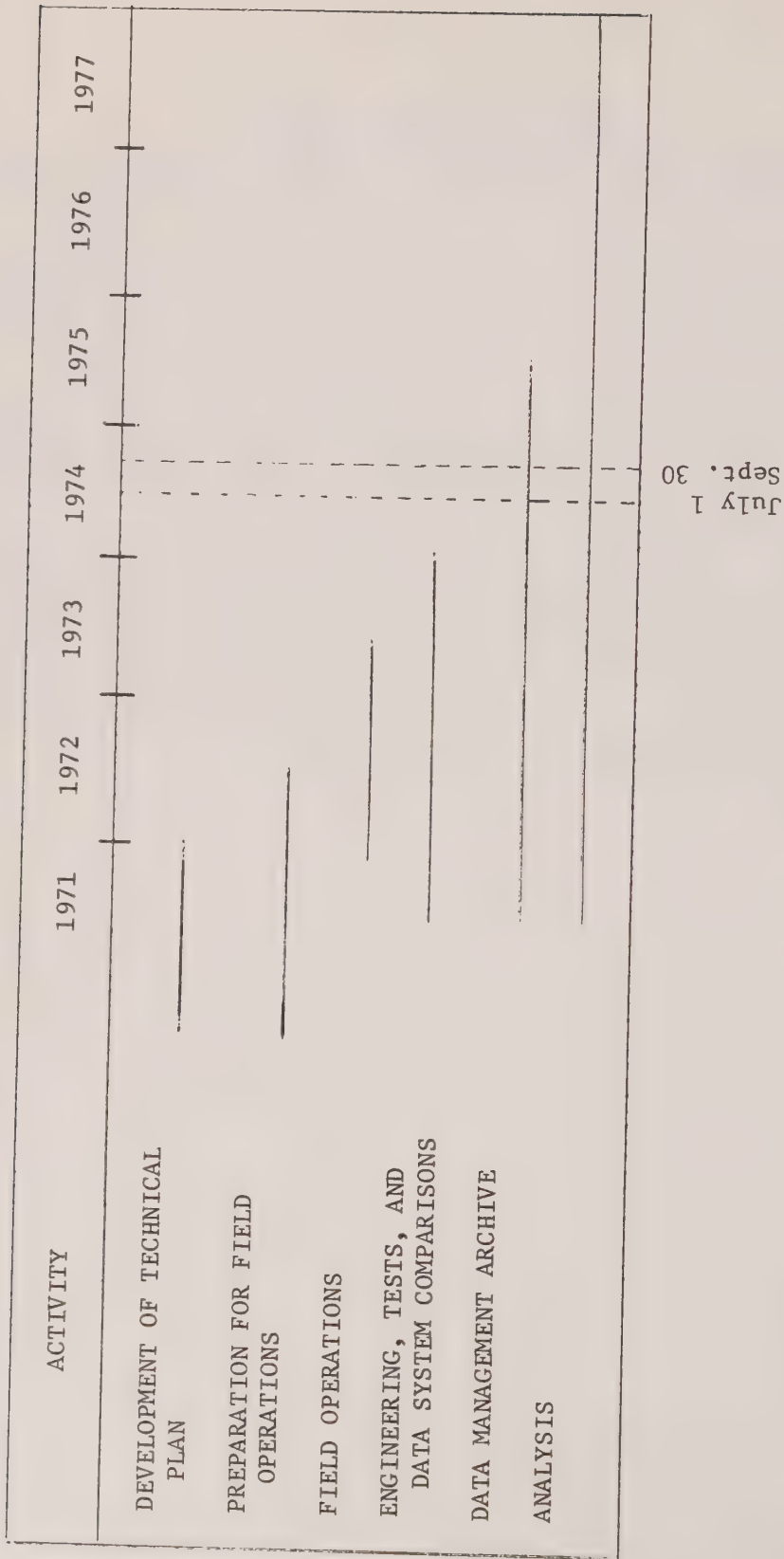


Figure 1.--U.S. IFYGL schedule.

U.S. SCIENTIFIC PROGRAM

Based upon reports requested by the U.S. IFYGL Project Office, the progress from July 1 through September 30, 1974, is presented for each of the U.S. IFYGL tasks. Some reports cover work done in October 1974.

Panel activity status reports follow the task reports.

Tasks

1. *Phosphorus Release and Uptake by Lake Ontario Sediments*

Principal Investigators: D.E. Armstrong and R.F. Harris - University of Wisconsin.

The task is completed, and the following reports have been submitted:

Bannerman, R.T., D.E. Armstrong, R.F. Harris, and G.C. Holdren, "Phosphorus Uptake and Release by Lake Ontario Sediments," Project Final Report, prepared for EPA Office of Research and Monitoring, Washington, D.C., 1974.

Bannerman, R.T., D.E. Armstrong, G.C. Holdren, and R.F. Harris, "Phosphorus Mobility in Lake Ontario Sediments," Proceedings of the 17th Conference on Great Lakes Research, International Association for Great Lakes Research, 1974.

2. *Net Radiation*

Principal Investigator: M.A. Atwater - CEM

Work on this task is almost complete, and a two-volume final report is expected to be finished by the end of October. The first volume will describe the model and results; the second will contain details on the computer program.

The following results are currently being analyzed: (1) comparison of observed and computed fluxes at several locations, and (2) computed radiative heating rates and radiative fluxes over Lake Ontario. Reports on the preliminary analysis of radiative fluxes and on the regression techniques for cloud analyses were presented at the Seventeenth Conference on Great Lakes Research in Hamilton, Ontario, in August 1974.

3. *REF/DC-6 Boundary Layer Fluxes*

Principal Investigator: B.R. Bean - ERL/NOAA

The final report on the flux measurements of momentum, heat, and water vapor, now being reviewed, should be available to the U.S. IFYGL Project Office in published form no later than February 1, 1975.

4. *Nitrogen Fixation*

Principal Investigator: R. Burris - University of Wisconsin

Task completed.

5. *Profile Mast and Tower Program*

Principal Investigator: J.A. Businger - University of Washington

No report.

6. *Status of Lake Ontario Fish Populations*

Principal Investigator: J.H. Kutkuhn - Great Lakes Fisheries Laboratory

No report.

7. *Material Balance of Lake Ontario*

Principal Investigator: D.J. Casey - EPA

Chemistry data from the Niagara, Genesee, Oswego, Black, and St. Lawrence rivers have been processed and organized for analysis. The materials contributions by the major tributaries have been calculated for all parameters (table 1). Total materials balances for the lake were prepared in conjunction with Steve Salbach of the Ministry of the Interior of the Province of Ontario, Canada, and presented at the Seventeenth Conference on Great Lakes Research in August. Further statistical refinement of the stream data is underway.

The statistical structure of the stream outflows and concentrations is being studied by means of time-series analysis. The time series are based on measurements of the stream outflow, substance concentrations, and chemical loadings as functions of time. Each set of measurements is regarded as a sample realization, from an infinite population of such samples, which could have been generated by the appropriate random process. Autocorrelations and power spectra programs have been developed to study the persistence in time of a measurement and the dominant frequencies of which the concentrations or outflow processes are composed. Correlations between pairs of concentrations and between concentrations and outflow are being studied by means of the crosscorrelation function. A pair of processes that is related shows a definite non-zero crosscorrelation. A maximum in the crosscorrelation function indicates a lag between the processes and should be helpful in determining causal relations between the two processes. The major objective of the statistical investigations is to extend and amplify what is already known of the deterministic basin processes.

8. *Runoff*

Principal Investigator: L.T. Schutze - U.S. Army Corps of Engineers

Work completed.

Table 1.--Material contribution by major tributaries on the U.S. side of Lake Ontario

Parameters	Niagara River			Genesee River			Oswego River			Black River		
	\bar{X} (Metric tons/day)	Confi- dence level (95%)	Lake loadings (g/m ² day $\times 10^{-3}$)	\bar{X} (Metric tons/day)	Confi- dence level (95%)		\bar{X} (Metric tons/day)	Confi- dence level (95%)		\bar{X} (Metric tons/day)	Confi- dence level (95%)	
TP	20.84	12	1.05	1.77	21		2.86	14		0.50	18	
OP	2.43	20	0.12	0.34	19		0.92	15		0.08	22	
NH ₃	19.72	26	1.00	3.73	41		6.66	13		1.51	19	
NO ₃	110.91	19	5.64	10.82	23		17.46	14		6.20	19	
TKN	107.91	6	5.49	3.28	11		11.62	10		2.04	19	
TN	218.82		11.12	14.09			29.09			8.25		
TOC	1,683.27	18	85.55	54.50	20		167.77	11		94.94	22	
SiO ₂	370.61	22	18.84	34.94	25		68.73	24		54.07	10	
SO ₄	10,730.72	14	545.41	509.89	19		1,559.01	10		102.09	25	
F	70.90	14	3.60	1.40	20		3.67	13		1.41	11	
Cl	15,183.67	3	771.71	319.34	21		4,032.83	9		28.54	18	
Na	9,117.73	10	463.41	279.16	10		1,754.25	8		39.41	10	
Mg	4,663.52	2	237.02	146.63	17		468.37	9		25.61	23	
Mn	7.90	19	0.40	1.25	19		1.24	19		0.74	16	
K	976.04	3	49.60	39.83	18		104.39	8		14.17	19	
Ca	20,232.20	3	1,028.31	471.92	11		2,352.32	7		159.43	20	
Ni	10.88	31	0.55	0.20	18		0.30	17		0.06	25	
Zn	51.07	45	2.60	1.00	29		0.81	21		1.16	33	
Cd	0.93	14	0.05	0.04	25		0.09	20		0.05	23	
Cu	4.86	13	0.25	0.21	19		0.49	19		0.20	27	
Fe	251.05	15	11.57	78.44	22		33.36	23		16.39	23	
Pb	10.85	12	0.50	0.37	24		0.94	15		0.27	22	

Table 1.--Material contribution by major tributaries on the U.S. side of Lake Ontario (Cont'd)

Param- eters	Minor tributaries		Ground water		Precipi- tation		Municipal		Total		St. Lawrence River	
	\bar{X} (Metric tons/day)	\bar{X} (Metric tons/day)	\bar{X} (Metric tons/day)	\bar{X} (Metric tons/day)	\bar{X} (Metric tons/day)	\bar{X} (Metric tons/day)	\bar{X} (Metric tons/day)	\bar{X} (Metric tons/day)	\bar{X} (Metric tons/day)	Lake loadings (g/m ² day x 10 ⁻³)	\bar{X} (Metric tons/day)	Confi- dence level (95%)
TP	0.56		0.11		4.51		1.66		28.23	1.44	21.56	9
OP									3.75	0.19	5.12	23
NH ₃									31.63	1.61	21.35	16
NO ₃									145.38	7.39	143.65	17
TKN									124.86	6.35	149.82	10
TN	3.76		0.94		62.21		4.22		278.22	14.14	293.47	
TOC									2,000.41	101.67	1,852.88	17
SiO ₂									528.33	26.85	459.94	13
SO ₄									17,491.13	655.76	18,567.34	4
F									77.39	3.93	77.26	10
Cl			23.47		67.05				19,563.88	995.75	19,102.55	3
Na									11,190.26	568.77	9,390.39	5
Mg									5,303.98	269.58	5,329.30	3
Mn									11.13	0.57	4.07	19
K									1,134.40	57.66	1,076.21	5
Ca									24,244.18	1,179.96	22,940.30	3
Ni									11.45	0.58	7.66	30
Zn									54.06	2.76	27.89	20
Cd									1.16	0.05	3.72	18
Cu									5.75	0.27		
Fe									379.24	18.09	583.95	26
Pb									12.43	0.58	21.85	10

 \bar{X} = mean of tonnage concentration

9. *Evaporation (Lake-Land)*

Principal Investigator: L.T. Schutze - U.S. Army Corps of Engineers

No further progress since last report.

10. *Simulation Studies and Analyses Associated With the Terrestrial Water Balance*

Principal Investigator: B.G. DeCooke - U.S. Army Corps of Engineers

Activity has not begun.

11. *Land Precipitation Data Analysis*

Principal Investigators: L.T. Schutze and R. Wilshaw - U.S. Army Corps of Engineers

No progress was made during this quarter.

12. *Transport Processes Within the Rochester Embayment of Lake Ontario*

Principal Investigators: T. Bonham-Carter and J.H. Thomas - University of Rochester³

The data for the Rochester embayment have been processed into final form as time series. Numerical modeling of wind-driven circulation in Lake Ontario and the Rochester embayment was carried out with a spatially variable eddy viscosity.

13. *Soil Moisture and Snow Hydrology*

Principal Investigator: W.N. Embree - U.S. Geological Survey

The statement in IFYGL Bulletin No. 11 (p. 37) to the effect that a complete report had been filed was in error. A very brief report containing data and accompanying summary explanation was submitted to the Terrestrial Water Balance Panel subsequent to the December 1973 meeting in Detroit.

A report entitled "Soil Moisture in the Black River Basin, New York, During the International Field Year for the Great Lakes," prepared by the Principal Investigator, is being reviewed and revised.

14. *Boundary Layer Structure and Mesoscale Circulation*

Principal Investigator: M.A. Estoque - University of Miami

See Task 15 below.

³ W.H. Diment is no longer Principal Investigator on this task.

15. *Mesoscale Simulation Studies*

Principal Investigator: M.A. Estoque - University of Miami

Considerable progress was made in numerical modeling, especially with the three-dimensional model. Simulations were made to study the lake breeze and cold outbreaks (air mass modification). Changes are being made in the model to incorporate topographical effects, which were not included in these simulations.

Plans are to finish the analysis and numerical simulation of the lake breeze over Brockport, N.Y., for October 1, 1972, and to present the results at the First AMS Conference on Regional and Mesoscale Modeling, Analysis, and Prediction in Las Vegas, Nev., in May 1975.

16. *Water Transfer Across Large Lake*⁴

Principal Investigator: H.W. Stoughton - State University of New York at Alfred⁵

Professor H.W. Stoughton of the State University of New York at Alfred is under contract to conduct this study.

17. *Nearshore Ice Formation, Growth, and Decay*

Principal Investigator: A. Pavlak and J. Dilley - General Electric Company

The numerical lakeshore ice-formation model was debugged and checked out during this period. The model computes in-depth water and soil temperatures in a two-dimensional plane normal to the shoreline at hourly intervals. It also computes the location of the freezing and melting fronts in the water and the soil, as well as the accompanying release, or absorption, of latent heat. Hourly inputs of solar and thermal radiation, air and dewpoint temperatures, and windspeed are used for computing the surface fluxes of shortwave and longwave radiation, evaporative and convective heat transfer, and the heat flux between the land mass and the lake.

A simulation was run for the period January 5 to 26, 1973. The calculated ice cover and water temperatures agreed well with the field data for times when there were no thermal plumes from the nuclear power station at Nine Mile Point, 1.5 km to the east of the field site. These plumes would cause temperature rises up to +6°C. A variable eddy diffusivity model is used to describe the turbulent mixing caused by wave action and nearshore currents. With these high diffusivities, being four to six orders of magnitude larger than the molecular

⁴Title changed.

⁵H.W. Stoughton has replaced C.B. Feldscher as Principal Investigator on this task.

value, the model showed the same thermal behavior as was observed during the Field Year, i.e., the water temperatures would drop to 0°C in depth from the surface to the bottom before ice would form on the surface. The bottom water temperatures would stay very close to zero until the ice broke up, the water being well mixed even under ice cover.

The in-depth soil temperatures were not predicted as closely as the water temperatures, as the former are more sensitive to surface heat transfer. The release of latent heat during ice formation or decay was found to be much larger than the heat flux between the land mass and the lake.

Analysis of field data and simulation results demonstrate that ice usually forms along the shore first, not primarily because of heat extracted by the land mass but because there is (1) increased surface heat transfer due to wave action, and (2) less thermal mass, due to shallower depths, to be cooled in depth to 0°C before surface freezing starts.

A paper entitled "Analysis of Lake Shore Ice Formation, Growth, and Decay" was presented at the Seventeenth Conference on Great Lakes Research. Copies are not yet available. However, a more detailed discussion is contained in "Analysis of Lake Shore Ice Formation, Growth, and Decay - IFYGL Phase 2 Final Report," GE/RESO Report No. 74SD2155, August 1974, a document that can be obtained from the U.S. IFYGL Coordinator, C.F. Jenkins.

18. *Advection Term - Energy Balance*

Principal Investigator: J. Grumblatt - GLERL/NOAA

Computer printouts were prepared showing the monthly diurnal temperature curves and the frequency distribution of daily average water temperature by month and year. At the Seventeenth Conference on Great Lakes Research, a paper was presented on the heat advection mechanisms in the upper St. Lawrence and lower Niagara Rivers, with special attention given to the impact of structural modification and regulation on advected heat.

19. *Occurrence and Transport of Nutrients and Hazardous Polluting Substances in the Genesee River Basin*

Principal Investigator: L.J. Hetling - New York State Department of Environmental Conservation

The task is completed, and the final report has been submitted to the EPA Grosse Isle Laboratory.

20. *Boundary Layer Flux Synthesis*

Principal Investigators: J.A. Almazan and J.K.S. Ching - CEDDA/NOAA

Two papers were presented at the Seventeenth Conference on Great Lakes Research: "Case Study of Lake-Land Breeze Circulation," by J.K.S. Ching, and "Objective Analysis of IFYGL Surface Meteorological Data," by J.B. Jalickee, J.K.S. Ching, and J.A. Almazan. The first, based on buoy and tower wind data for July 1972, deals with the diurnal lake-land circulation over Lake Ontario

and shows the divergence and vorticity fields. In the second, an orthogonal function objective analysis scheme is used to describe the July and October 1972 buoy meteorological data, and derived quantities, such as momentum, heat, and moisture flux estimates, are presented.

Work has begun on preparing summaries of the Canadian and United States buoy and tower meteorological data. These summaries, presented in matrix form, will include weekly averages and standard deviations of each variable by station. A cross-product, variance, and correlation matrix will also be used to depict the weekly averages.

A first draft of "A Comparison of the U.S. and Canadian Meteorological Buoy Data During IFYGL" has been prepared.

21. *Hazardous Material Flow*

Principal Investigator: T. Davies - EPA

A final report is being prepared in draft form.

22. *Remote Measurement of Chlorophyll With Lidar Fluorescent System*

Principal Investigator: H.H. Kim - NASA

The task is completed.

23. *Inflow/Outflow Term - Terrestrial Water Budget*

Principal Investigator: P.L. Cox - U.S. Army Corps of Engineers

A final report on the outflow term has been submitted to the U.S. IFYGL Archive. The Water Survey of Canada is working on a revised final report on the inflow term.

24. *Use of an Unsteady State Flow Model To Compute Continuous Flow*

Principal Investigator: P.L. Cox - U.S. Army Corps of Engineers

Reduction of discharge measurements on the St. Clair River is completed.

25. *Radiant Power, Temperature, and Water Vapor Profiles Over Lake Ontario*

Principal Investigator: P.M. Kuhn - ERL/NOAA

Work completed.

26. *Algal Nutrient Availability and Limitation in Lake Ontario*

Principal Investigator: G.F. Lee - University of Texas at Dallas

Two papers were presented at the Seventeenth Conference on Great Lakes Research: "Nitrogen and Phosphorus Availability in Lake Ontario Tributary Waters During IFYGL," by W.F. Cowen, K. Sirisinha, and G. Fred Lee; and "Algal

Nutrient Limitation in Lake Ontario and Tributary Waters," by N. Sridharan and G. Fred Lee. Both papers have been submitted for publication in the Conference Proceedings. Preprint copies are available on request, as long as the supply lasts, from G. Fred Lee, Institute for Environmental Sciences, The University of Texas at Dallas, P.O. Box 688, Richardson, Tex. 75080.

A Ph.D. thesis entitled "Algal Nutrient Availability and Limitation in Lake Ontario During IFYGL" was completed by William Cowen. It is on file in the University of Wisconsin, Madison, library.

27. *Wave Studies*

Principal Investigator: P.C. Liu - GLERL/NOAA

Basic reduction and analysis of the data recorded by the four waverider buoys is complete. Daily summaries, including hourly statistics and plots, are now available on microfilm from the National Climatic Center, Asheville, N.C. These data reports can be used both as guides for further analysis and as indexes of the digital wave data tapes maintained at the Great Lakes Environmental Research Laboratory (GLERL), Ann Arbor, Mich.

A paper on "Duration-Limited Wave Spectra in Lake Ontario During the 1972 Hurricane Agnes" was presented at the Seventeenth Conference on Great Lakes Research. The abstract reads as follows:

"Analyses of hourly wave spectra during the hurricane Agnes, June 22-23, 1972, from two waverider recordings at Oswego-1 and Oswego-2 in Lake Ontario show that the growth and decay of significant wave heights follow in approximately linear pattern with time during respectively increasing and decreasing wind speed. The initial growth of wave spectra from a relatively calm condition is quite rapid and abrupt and the growth rate is not linear. The development of individual spectral components can be grouped into three spectral ranges: a low frequency range where the components are most sensitive to wind, a high frequency range where the components are generally independent of time or wind stress, and a middle frequency range which possesses both high and low frequency range properties."

28. *Cloud Climatology*

Principal Investigator: W.A. Lyons - University of Wisconsin, Milwaukee

No report.

29. *Zooplankton Production in Lake Ontario as Influenced by Environmental Perturbations*

Principal Investigator: D.C. McNaught - State University of New York at Albany

Work on this task is completed, and a final report has been submitted to EPA.

30. *Change in Lake Storage Term - Terrestrial Water Budget*

Principal Investigator: R. Wilshaw - U.S. Army Corps of Engineers

No progress was made during this quarter.

31. *Soil Moisture*

Principal Investigator: L.T. Schutze - U.S. Army Corps of Engineers

Lack of manpower and incomplete data from other IFYGL investigators continue to delay start on this task.

32. *Testing of COE (Corps of Engineers) Lake Levels Model*

Principal Investigator: E. Megerian - U.S. Army Corps of Engineers

This task has been canceled.

33. *Nearshore Study of Eastern Lake Ontario*

Principal Investigator: R.B. Moore - State University of New York at Oswego

Work is completed, and a final report has been submitted to EPA.

34. *Internal Waves - Transects Program - Interpretation of Whole-Basin Oscillations*

Principal Investigator: C.H. Mortimer - University of Wisconsin, Milwaukee

No report.

35. *Pontoporeia affinis and Other Benthos in Lake Ontario*

Principal Investigator: S.C. Mosley - University of Michigan

No report.

36. *Pan Evaporation Project*

Principal Investigators: C.N. Hoffeditz - NWS/NOAA
J.A.W. McCulloch - AES, Canada

No report.

37. *Simulation Studies and Other Analyses Associated With U.S. Water Movements Projects*

Principal Investigators: J.P. Pandolfo and C.A. Jacobs - CEM

Task is completed, and a four-volume final report has been submitted to the U.S. IFYGL Project Office.

38. *Structure of Turbulence*

Principal Investigator: H.A. Panofsky - Pennsylvania State University

The task is completed. Fifty copies of the final report are being produced.

39. *Airborne Snow Reconnaissance*

Principal Investigator: E.L. Peck - NWS/NOAA

A draft of the final report has been prepared.

40. *Optical Properties of Lake Ontario*

Principal Investigator: K.R. Piech - Calspan Corporation

There was no activity during this reporting period. Data analyses were resumed in October, and most of the remaining work will be completed by the end of the next quarter.

41. *Storage Term - Energy Balance Program*

Principal Investigator: A.P. Pinsak - GLERL/NOAA

Data recorded from June to October 1972 by the U.S. offshore tower and buoy water-temperature sensors were used to compute daily mean water temperatures for four cells within Lake Ontario and for each of their layered subdivisions.

A paper entitled "Heat Storage in Lake Ontario" was presented at the Seventeenth Conference on Great Lakes Research.

Further work depends upon availability of shipboard physical data.

42. *Sensible and Latent Heat Flux*

Principal Investigator: A.P. Pinsak - GLERL/NOAA

Further work on this task relating to evaluation of the Bowen ratio cannot be done until shipboard physical data become available.

43. *Thermal Characteristics of Lake Ontario and Advection Within the Lake*

Principal Investigator: A.P. Pinsak - GLERL/NOAA

Change in heat storage in four south-shore cells of Lake Ontario from June to October 1972 was computed. Time-related advection of heat within these cells was determined, and its relationship to the basic thermal regime was established. Expansion of this task to lake scale depends upon availability of PDCS and shipboard physical data.

44. *Oswego Harbor Studies*

Principal Investigator: G.L. Bell - GLERL/NOAA

The chemical and physical data have been organized by parameter, station, and cruise and stored on seven-track magnetic tape for inclusion in the IFYGL Archive. A paper on "Diffusion at Oswego Harbor, N.Y.," summarizing the results of this study, was presented at the Seventeenth Conference on Great Lakes Research. The final report is being prepared.

45. *Mapping of Standing Water and Terrain Conditions With Remote Sensor Data*

Principal Investigator: F.C. Polcyn - ERIM

Work on this task is completed, and a draft of the final report has been submitted to NASA.

46. *Remote Sensing Program for the Determination of Cladophora Distribution*

Principal Investigators: F.C. Polcyn and C.T. Wezernak - ERIM

A final report has been submitted to the EPA Grosse Isle Laboratory in draft form.

47. *Remote Sensing Study of Suspended Inputs Into Lake Ontario*

Principal Investigators: F.C. Polcyn and C.T. Wezernak - ERIM

A draft of the final report has been submitted to NASA.

48. *Island-Land Precipitation Data Analysis*

Principal Investigator: F.H. Quinn - GLERL/NOAA

The precipitation data collected have been processed. The report on overland precipitation has been revised and will be published after final review.

A Thiessen polygon procedure and data from 57 National Weather Service stations were used in deriving daily precipitation values for the U.S. portion of the Lake Ontario land basin for 1972 and 1973.

Review and tabulation of data for the eastern Lake Ontario precipitation network were begun.

49. *Lake Circulation, Including Internal Waves and Storm Surges*

Principal Investigator: D.B. Rao - University of Wisconsin, Milwaukee

No report.

50. *Atmospheric Water Balance*

Principal Investigator: E.M. Rasmusson - CEDDA/NOAA

Data from all three periods of intensive rawinsonde observations have been checked. All obvious errors have been identified and the corrections listed in the form of a log. Cross sections of the basic quantities for October 31 to November 15, 1972, have been generated, and a corrected data set for this period has been placed on magnetic tape.

Manually worked up soundings for 1 day and the same soundings processed automatically are being compared to determine if any biases are introduced by the manual workup procedure.

Six days of data from rawinsonde descents were worked up for five stations. So far, the results appear to be consistent with the standard ascent data. For example, the descent temperature is lower than the ascent temperature above the inversion. Below the top of the inversion, the descent temperature becomes warmer and then reverses sign again below the base of the inversion, as would be expected from thermal lag effects.

A new technique is being used for fitting the important features of the meteorological fields. Known as asymptotic singular decomposition, this technique makes it possible to first extract from the data the mean feature of a meteorological field and then, stepwise, to extract successively finer details. The method was applied to data for the 6-day period from October 20 to November 4, 1972. The computed mass divergence was found to be generally consistent with the thermal and synoptic features of this period. The water balance parameters were also computed, and results are being evaluated.

51. *Evaporation Synthesis*

Principal Investigator: F.H. Quinn - GLERL/NOAA

Additional first-cut evaporation data have been received.

52. *Groundwater Flux and Storage*

Principal Investigator: E.C. Rhodehamel - U.S. Geological Survey

Task completed.

53. *Spring Algal Bloom*

Principal Investigator: A. Robertson - GLERL/NOAA

Analysis awaits availability of data.

54. *Ice Studies for Storage Term - Energy Balance*

Principal Investigator: F.H. Quinn - GLERL/NOAA

Work on this task is complete. The data and accompanying report have been placed in the IFYGL Archive.

55. *Lagrangian Current Observations*

Principal Investigator: J.H. Saylor - GLERL/NOAA

A paper covering some measurements and interpretations of coastal currents in the spring thermal bar period in western Lake Ontario was presented at the Seventeenth Conference on Great Lakes Research. Final reports on the experimental results are being prepared.

56. *Circulation of Lake Ontario*

Principal Investigator: J.H. Saylor - GLERL/NOAA

Spatial coherence in current flows between moored current meters is being investigated by comparison of buoy measurements with Lagrangian flows. Distinct seasonal variations in the width of coherent flow patterns have been found.

57. *Phytoplankton Nutrient Bioassays in the Great Lakes*

Principal Investigator: C. Schelske - University of Michigan

Task not activated.

58. *Runoff Term of Terrestrial Water Budget*

Principal Investigator: G.K. Schultz - U.S. Geological Survey

Task completed.

59. *Coastal Chain Program*

Principal Investigator: J.T. Scott - State University of New York at Albany

A second data report is being prepared, which will contain data from all five coastal chains, as well as data on daily wind and wind stress, where available. Daily transport is plotted over time for the three alert periods. The report will include measured and computed barotropic geostrophic

transport components. The transport is computed in three different ways: total cross-sectional, within a defined jet core, and above and below the thermocline.

60. *Analysis of Phytoplankton Composition and Abundance*

Principal Investigator: E.F. Stoermer - University of Michigan

Work is completed, and the final report has been submitted to the EPA Grosse Isle Laboratory.

61. *Clouds, Ice, and Surface Temperature*

Principal Investigator: A.E. Strong - NESS/NOAA

A paper entitled "Great Lakes Temperature Maps By Satellite" was presented at the Seventeenth Conference on Great Lakes Research.

62. *Analysis and Model of the Impact of Discharges From the Niagara and Genesee Rivers on Nearshore Biology and Chemistry*

Principal Investigator: R.A. Sweeney - State University of New York at Buffalo

The final report on this task has been submitted to the EPA Grosse Isle Laboratory.

63. *NCAR/DRI - Buffalo Program*

Principal Investigator: J.W. Telford - Desert Research Institute, University of Nevada

A paper entitled "Analysis of Airborne Measurements of Horizontal and Vertical Air Motion Over Lake Ontario" was presented at the Seventeenth Conference on Great Lakes Research.

64. *Mathematical Modeling of Eutrophication of Large Lakes*

Principal Investigator: R.V. Thomann - Manhattan College

The LAKE 1 model has been verified, and a report on the verification is being completed. Preparations for simulations with this model are underway.

A paper entitled "Mathematical Modeling of Phytoplankton in Lake Ontario" was presented at the Seventeenth Conference on Great Lakes Research.

65. *Cladophora Nutrient Bioassay*

Principal Investigator: G.F. Lee - University of Texas at Dallas

Inactive.

66. *Sediment Oxygen Demand*

Principal Investigator: N.A. Thomas - EPA

Comparative calculations are being made from the dissolved oxygen profiles that were obtained from the Researcher and the sediment oxygen demand (SOD) rates. Data on SOD rates are available in preliminary form.

67. *Main Lake Macrobenthos*

Principal Investigator: N.A. Thomas - EPA

A paper entitled "Macrobenthos and Sediment Analysis of Lake Ontario, June and November, 1972" was presented at the Seventeenth Conference on Great Lakes Research.

68. *Exploration of Halogenated Hazardous Chemicals in Lake Ontario*

Principal Investigators: G.F. Lee - University of Texas at Dallas
C.L. Haile - University of Wisconsin

The task is completed, and the following report has been submitted to EPA:

Haile, C.L., G.D. Veith, G.F. Lee, and W.C. Boyle, "Chlorinated Hydrocarbons in the Lake Ontario Ecosystem," Project Final Report, prepared for EPA Office of Research and Monitoring, Washington, D.C., 1974.

69. *Basin Precipitation - Land and Lake*

Principal Investigator: J.W. Wilson - CEM

Steady progress is being made in determining the final precipitation estimates for Lake Ontario and its watershed based on combined radar and rain-gage data. Analysis of daily precipitation totals based solely on rain-gage data is complete. It covers the entire Lake Ontario basin with a grid spacing of 3.5 mi. A recently discovered error in the computer handling of the gage data for the extreme eastern part of the watershed will require correction.

Edited magnetic tapes of daily precipitation totals derived from both the Oswego and Buffalo radars have been produced. They contain corrections for beam blocking, atmospheric attenuation, and ground clutter. The daily precipitation as estimated from the two radars within a 2-mi radius of the gages was also determined, and the ratios between these estimates and the actual gage measurements are used as input to an objective analysis program that was developed for deriving correction fields for the radar data. Tests indicate the necessity for applying empirical range corrections to the radar data before final correction fields can be derived. Studies are underway to establish these range adjustment factors, which investigations have shown to vary with precipitation type and level of freezing height. It was also found

that gages located near the edges of heavy showers should not be used in deriving the correction field. The gage data are currently being examined for removal of errors.

70. *Evaluation of ERTS Data for Certain Hydrological Uses*

Principal Investigators: D.R. Wiesnet and D.F. McGinnis - NESS/NOAA

No report.

71. *Distribution, Abundance, and Composition of Invertebrate Fish Forage Mechanisms in Lake Ontario*

Principal Investigator: J.H. Kutkuhn - Great Lakes Fisheries Laboratory

No report.

72. *Coastal Circulation in the Great Lakes*

Principal Investigator: G.T. Csanady - Woods Hole Oceanographic Institution

One of the interesting results obtained from the IFYGL Lake Ontario data is that "right-hand" coastal jets, viewed along the wind, are generally stronger than left-hand ones. Randomly varying wind impulses should thus produce a cyclonic mean circulation in similar large lakes, as has been suggested in the literature, based on observations. One possible cause of asymmetry between right- and left-hand coastal jets is nonlinear momentum advection, the importance of which has been assessed in a recent paper entitled "Lateral Momentum Flux in Boundary Currents," WHOI Contribution No. 3409. In the Great Lakes, this momentum flux is estimated to be only marginally important, because it is rather less than the direct momentum flux from wind to coastal currents.

Work has also been done on the role of friction in coastal currents, and a tentative model has been constructed in which the eddy viscosity is scaled according to empirically known similarity laws. Preliminary results are that frictional effects over the usual gently sloping beaches are dominated by depth variations and that lateral momentum flux due to "horizontal" eddy viscosity plays a subordinate role.

The joint paper with J.T. Scott, "Baroclinic Coastal Jets in Lake Ontario during IFYGL" appeared in the Journal of Physical Oceanography, Vol. 4, No. 4, October 1974, pp. 524-541.

73. *Lake Water Characteristics*

Principal Investigator: A.P. Pinsak - GLERL/NOAA

Further progress on this task depends on availability of lake water data from the EPA STORET system.

74. *Snow Observation Network*

Principal Investigator: R.B. Sykes, Jr. - State University of New York
at Oswego.

A paper entitled "IFYGL Precipitation Gage Networks" was presented at the Seventeenth Conference on Great Lakes Research. Work on this task is complete.

75. *Lake Circulation Model*

Principal Investigator: J.R. Bennett - MIT

The numerical model was not run during the summer but is now operating again. The study of Lake Ontario circulation in July 1972 is continuing. Particular attention is being given to understanding why the model does not reproduce adequately the observed cyclonic circulation.

76. *Lake Ontario Invertebrate Fauna List*

Principal Investigator: A. Robertson - GLERL/NOAA

No report.

77. *Distribution and Variability of Physical Lake Properties*

Principal Investigator: R. Pickett - GLERL/NOAA

Lake Ontario temperature and current data for July and August 1972 have been edited. Monthly means and lakewide averages are shown in tables 2 to 8. Several differences are evident. The thermocline is slightly deeper and stronger in August, and some 2×10^{18} calories were added between July and August. Horizontal current averages shown in table 7 indicate that both scalar and resultant speeds increased in August. An especially large increase in scalar speed occurred at the thermocline, probably because of increased internal waves. As seen in table 8, kinetic energy increased as a result of increased flow speeds, and potential energy decreased as July's cold central core was eroded.

78. *Carbon Cycle Model*

Principal Investigators: A. Robertson and B. Eadie - GLERL/NOAA

An average-year carbon budget for Lake Ontario has been developed from data available prior to IFYGL. A comparison of this budget with the carbon budget for the Field Year discussed in IFYGL Bulletin No. 12 is summarized graphically in figure 2. The budgets obtained for the two periods are quite similar, suggesting that the contributions of the major budget terms are probably roughly constant from year to year.

Table 2.--July mean temperatures (°C)

Depth (m)	Station No.																		
	1	2	3	4	5	6	8	9	10	11	13	14	16	17	19	20	21	23	24
0	16.1	16.0	17.3	19.8	19.3	16.9	17.0	17.7	17.7	18.5	19.4	17.6	18.2	14.7	17.3	17.9	18.3		
1																			
2																		20.1	20.4
3																		19.9	19.1
4																		19.9	18.9
5																		19.8	18.7
7																		19.6	18.3
9																		18.6	17.1
10																		17.8	16.2
11																			
13																			
15																			
17																			
19																			
20																			
25																			
30																			
35																			
40																			
50																			
60																			
75																			
100																			
150																			

Table 4.--July monthly resultant currents

Station No.		Depth (m)					3 off bottom
		5	10	15	30	50	
2	Speed (cm/s)		3.1		2.7	0.2	
	Direction (°)		028		034	251	
3	Speed (cm/s)		0.2	0.3			
	Direction (°)		300	167			
4	Speed (cm/s)		1.8	1.9	0.8		
	Direction (°)		094	073	103		
5	Speed (cm/s)			1.6			
	Direction (°)			059			
6	Speed (cm/s)		1.1	1.5		0.4	
	Direction (°)		282	263		357	
8	Speed (cm/s)		7.7	1.4	0.8		
	Direction (°)		262	292	277		
9	Speed (cm/s)			1.5	1.6	1.6	
	Direction (°)			326	318	325	
10	Speed (cm/s)		2.8	2.1	0.9	0.3	
	Direction (°)		347	322	304	314	
11	Speed (cm/s)		2.6	2.1			
	Direction (°)		272	263			
13	Speed (cm/s)	3.8		0.7	0.2		0.7
	Direction (°)	111		038	314		277
16	Speed (cm/s)	1.8		0.6	0.5		0.1
	Direction (°)	126		016	357		084
19	Speed (cm/s)			0.6	0.3		0.2
	Direction (°)			264	304		263
20	Speed (cm/s)	1.6		0.2	0.4		0.5
	Direction (°)	008		042	048		036
21	Speed (cm/s)	1.1		1.1	0.1		0.1
	Direction (°)	022		001	131		290
23	Speed (cm/s)		0.8	0.4			
	Direction (°)		050	057			
26	Speed (cm/s)	11.2		2.1			
	Direction (°)	099		031			
32	Speed (cm/s)		1.3				
	Direction (°)		243				
34	Speed (cm/s)		0.4				
	Direction (°)		287				
41	Speed (cm/s)		0.7				
	Direction (°)		088				
55	Speed (cm/s)		3.5				
	Direction (°)		281				

Table 5.--August monthly resultant currents

Station No.	Depth (m)							
	2	4	5	10	15	19	30	50 3 off bottom
2	Speed (cm/s)			1.8	5.6		1.5	1.9
	Direction (°)			238	036		019	069
3	Speed (cm/s)			1.8	1.4		1.7	
	Direction (°)			293	295		259	
4	Speed (cm/s)			0.7	1.9		2.1	1.1
	Direction (°)			037	072		274	300
5	Speed (cm/s)			4.9	2.0			
	Direction (°)			075	050			
6	Speed (cm/s)			2.2	3.9		2.4	1.3
	Direction (°)			084	069		065	119
8	Speed (cm/s)			6.8	1.7		0.5	
	Direction (°)			070	010		048	
9	Speed (cm/s)			3.7	3.6		1.2	0.8
	Direction (°)			309	319		075	069
10	Speed (cm/s)			2.4	1.7		1.4	0.3
	Direction (°)			010	020		013	312
11	Speed (cm/s)			2.9	1.8			2.6
	Direction (°)			257	270			268
12	Speed (cm/s)		1.3		0.7		1.6	1.5
	Direction (°)		245		309		312	293
13	Speed (cm/s)						0.4	0.2
	Direction (°)						170	201
14	Speed (cm/s)		0.3				0.3	0.9
	Direction (°)		191				280	253
15	Speed (cm/s)						2.2	
	Direction (°)						091	
16	Speed (cm/s)		0.7		0.8		0.8	0.8
	Direction (°)		142		248		070	028

Table 5.--August monthly resultant currents (Cont'd)

Station No.		Depth (m)							
		2	4	5	10	15	19	30	50 3 off bottom
17	Speed (cm/s)			0.0		7.2		0.7	0.2
	Direction (°)			318		355		210	178
20	Speed (cm/s)			13.4		2.3		2.0	0.2
	Direction (°)			061		070		072	093
21	Speed (cm/s)			9.1		8.5		0.9	0.2
	Direction (°)			058		087		135	026
23	Speed (cm/s)					1.8	3.5		
	Direction (°)					134	070		
24	Speed (cm/s)	0.5	0.7						
	Direction (°)	294	218						
26	Speed (cm/s)	6.4		7.7		8.0	3.1		
	Direction (°)	081		088		338	155		
27	Speed (cm/s)	0.9	1.3						
	Direction (°)	052	107						
32	Speed (cm/s)				3.2				
	Direction (°)				243				
34	Speed (cm/s)				4.6				
	Direction (°)				239				
36	Speed (cm/s)				5.8				
	Direction (°)				063				
41	Speed (cm/s)				1.5				
	Direction (°)				352				
55	Speed (cm/s)				5.2				
	Direction (°)				327				
59	Speed (cm/s)				6.6				
	Direction (°)				022				

Table 6.---Lake-averaged temperature means ($^{\circ}\text{C}$)

Depth (m)	July	August	Difference
0	17.9	19.1	1.2
5	17.1	19.0	1.9
10	10.8	15.4	4.6
15	8.9	12.7	3.8
20	6.6	10.0	3.4
25	5.5	8.0	2.5
30	5.1	6.3	1.2
35	4.8	5.7	0.9
40	4.6	5.1	0.5
50	4.2	4.3	0.1
60	4.1	4.2	0.1
75	3.9	3.9	0.0
100	3.9	3.9	0.0
150	3.7	3.8	0.1

Table 7.---Lake-averaged monthly current speeds (cm s^{-1})

Depth (m)	July		August	
	Resultant	Scalar	Resultant	Scalar
5	4.3	9.1	4.6	8.0
10	2.2	6.8	3.6	11.4
15	1.2	4.1	3.2	8.1
30	0.8	2.4	1.3	4.7
50	0.6	3.6	1.3	5.5
3 off bottom	0.3	0.8	0.6	1.5

Table 8.---Energy in Lake Ontario (10^{18} ergs)

Energy	July	August
Kinetic	9.89	21.7
Potential	2380.0	1960.0
Total	2390.0	1980.0

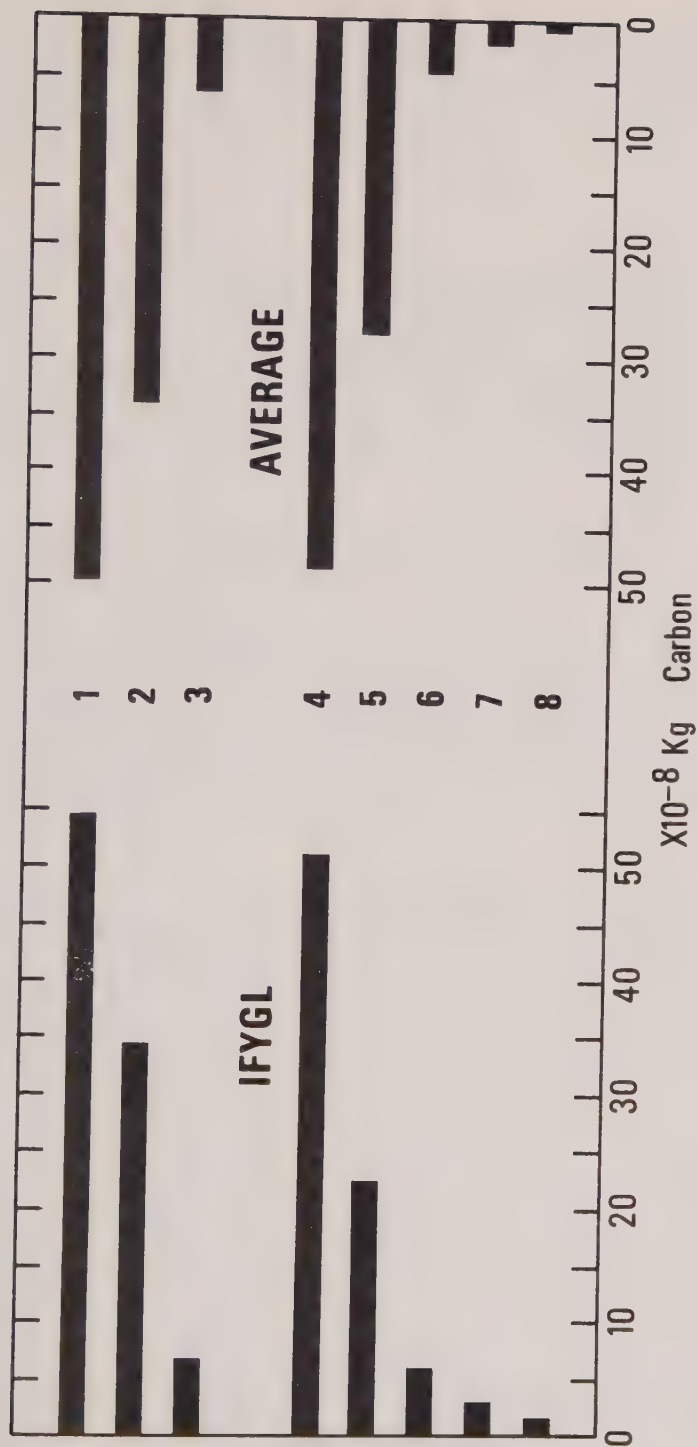


Figure 2. --Comparison between the estimates of the terms in the carbon budget for IFYGL and those for an average year; 1 = inorganic carbon in the inflowing rivers, 2 = carbon input from the atmosphere, 3 = organic carbon in the inflowing rivers, 4 = inorganic carbon outflow in the St. Lawrence River, 5 = net exchange of carbon between the atmosphere and the dissolved inorganic carbon pool, 6 = organic carbon outflow in the St. Lawrence, 7 = net carbon exchange in sedimentary disposition-decomposition of organic matter, 8 = net carbon exchange in precipitation-dissolution of CaCO_3 .

Panel Reports

Boundary Layer - J.Z. Holland, U.S. Panel Cochairman

The Boundary Layer Panel met at McMaster University, Hamilton, Ontario, on August 12, 1974, during the Seventeenth Conference on Great Lakes Research. At the meeting the status of each project was reviewed, and the panel's final scientific report was discussed. Tentatively, the report will be prepared within 1 year and will consist of two- to three-page summaries by each of the principal investigators, with an introduction by the Cochairman.

Also discussed was the use in other lake studies of the surface flux estimates of momentum, heat, and moisture for Lake Ontario derived by the panel. It was agreed that the preliminary weekly evaporation estimates provided by F.C. Elder of CCIW will be kept until the tower, aircraft, and buoy data become available for CEDDA to calculate cross-products of windspeed and (1) air-lake temperature differences, (2) air-lake humidity differences, and (3) wind vector magnitude. These products will be available in about 2 years for the May to November 1972 period.

Nine papers were presented by panel members at the Seventeenth Conference on Great Lakes Research.

Terrestrial Water Balance - B.G. DeCooke, U.S. Panel Cochairman

Following review by the IFYGL Joint Management Team and Joint Steering Committee, the outline for the Terrestrial Water Balance Panel scientific report was approved by the Cochairmen of the Joint Management Team on October 30, 1974. Writing of a first draft of the report will begin in January 1975.

Water Movements - J.H. Saylor, U.S. Panel Cochairman

Several papers were presented by panel members at the Seventeenth Conference on Great Lakes Research. At the meeting, informal discussions were held with investigators working on closely related topics in order to plan for inputs to the scientific report on water movements.

DATA MANAGEMENT

Data Processing

The status of data processing done at the Center for Experiment Design and Data Analysis (CEDDA) is given below. The various data sets, as they are completed, will be available from the National Climatic Center (NCC) in accordance with the IFYGL Archive Plan.

Ship System

All 1-s time-series plots are complete, except for the Advance II cruise 4, which presents time-code problems and requires special handling. Data from 50 of the 55 cruises that are processable have been run through the 6-min edit and averaging program, and time-series plots of 19 of these have been put on microfilm. Microfilm plotting of some 1,300 EBT casts for validation and archival was begun. The tape of 217 XBT's generated by NODC has been decoded, read, and printed. Station numbers that are missing will be merged on this tape before shipment to NCC.

Physical Data Collection System (PDCS)

The PDCS Provisional Data Base for May 1972 to March 1973 is complete. It consists of merged data from all sources, with final calibration applied. No editing has been done, and gross errors may be present. The data are available from the U.S. archive at NCC on seven-track, 800 BPI, BCD tapes; microfilm displays of the individual 6-min observations and time-series graphics are also available. Copies of the magnetic tapes and microfilm have been forwarded to CCIW.

Final editing of the PDCS data is underway. Manual editing has been completed for the entire data set, and the March and May 1972 data have been passed through the automatic editing routine.

IFYGL Archive

The "IFYGL Basic Data Inventory," a four-volume working document containing a by-parameter listing of data planned to be collected and actually obtained during the Field Year, was distributed to IFYGL investigators and management personnel in November 1974. The intent in issuing this preliminary version, based on the IFYGL Data Catalog, was twofold: to enable investigators to locate data collected by others that may be relevant to their work, and to give IFYGL participants and opportunity for a critical evaluation. Any errors, inconsistencies, and ambiguities in the Data Catalog are also reflected in this preliminary inventory. It is of great importance that users of this document be vigorous in their criticism and constructive in their comments, in order that the final archival Basic Data Inventory be complete and accurate. Modifications of information or format and questions

concerning procedures for updating information should be forwarded to:

IFYGL Data Manager, Room 52
Environmental Data Service
National Oceanic and Atmospheric
Administration
Federal Building
Asheville, N.C. 28801

Tel: (704) 258-2850, Ext. 754; FTS (704) 254-0754

Those who have copies of the "IFYGL Basic Data Inventory" should note cancellation of Projects C3WM (Vol. 1, pp. 25 and 87); C29BL (Vol. 1, pp. 2, 5, 6, 21, 27, 32, 61, 62, 82, 92, 94, and 95); and C90WM (Vol. 1, pp. 25 and 26). Also, Projects C87EB (Vol. 1, p. 89) and C88EB (Vol. 1, pp. 62 and 89) were listed incorrectly and should be included under Project 42EB.

Tables 9 and 10 contain a summary listing of data available through the U.S. IFYGL Archive at NCC as of November 1, 1973. Requests from U.S. IFYGL investigators, and others, should be directed to the above address.

As stated by the Director, U.S. IFYGL Project Office, in IFYGL Bulletin No. 6: "Data requests from U.S. IFYGL participants will be filled to the extent feasible and as specified in the IFYGL Technical Plan. Service charges will be imposed to cover retrieval costs for **other** data requested that do not meet the criteria established by the Technical Plan."

Table 9.--Summary of data available from final
IFYGL Archive: United States

TASK NO.	INVESTIGATOR	DESCRIPTION OF DATA	MEDIA
3	<u>PANEL</u>	<u>ATMOSPHERIC BOUNDARY LAYER</u>	
	Bean	<u>RFF/DC-6 (Gust Probe)</u>	
		3. Reduced turbulence data.	Mag. tape
		4. Computed flux spectra, time series spectra.	Microfilm
		5. Time-series graphics (u, v, w, T, ρ_w).	Microfilm
		6. Means, variances, and fluxes.	Microfilm
60	<u>PANEL</u>	<u>BIOLOGY - CHEMISTRY</u>	
	Stoermer	<u>Phytoplankton</u>	
		3. Data count: prereport.	Microfiche
73	<u>PANEL</u>	<u>Lake Water Characteristics</u>	
	Pinsak	1. Edited depth, temperature, and chemical composition data.	Mag. tape
17	<u>PANEL</u>	<u>ENERGY BALANCE</u>	
	Pavlak	<u>Nearshore Ice Formation</u>	
		2. Meteorological data: automatic van (temperature, wind, radiation, pressure).	Mag. tape
		5. Data report.	Paper
18	<u>PANEL</u>	<u>Water Temperature Gages</u>	
	Grumblatt	2. Raw water temperature, 1/5 min.	Mag. tape
54	<u>PANEL</u>	<u>Lake Ontario Ice Studies</u>	
	Quinn	1. Ice thickness: manual measurement.	Microfiche
		a. Five sites, weekly.	
		b. Ice patterns: graphic display.	
		c. Surface meteorological data.	
		d. Albedo measurement.	

Table 9.--Summary of data available from final
IFYGL Archive: United States (Cont'd)

TASK NO.	INVESTIGATOR	DESCRIPTION OF DATA	MEDIA
	<u>PANEL</u>	<u>MAJOR U.S. IFYGL SYSTEMS</u>	
100	CEDDA	<u>Physical Data Collection System</u> 1. Basic data base in engineering counts. 2. Provisional meteorological and limnological data (6 min). 3. Limnological data listing. 4. Limnological time series graphics. 11. Analyst's technical manual and system field documentation.	Mag. tape Mag. tape Microfilm Microfilm Microfilm
101	CEDDA	<u>U.S. IFYGL Ship System - Researcher</u> 2. Raw data digital decommutated tapes. 3. 1-s data (1/10-s subsurface). 9. Manual observations, edited. 11. 9-point digitized EBT. 12. EBT-x,y traces. 16. Dissolved oxygen traces. 17. Barograph charts.	Mag. tape Mag. tape Mag. tape Mag. tape Microfilm Microfilm Charts
102	CEDDA	<u>U.S. IFYGL Ship System - Advance II</u> 2. Raw data digital decommutated tapes. 3. 1-s data (1/10-s subsurface). 9. Manual observations, edited.	Mag. tape Mag. tape Mag. tape
103	CEDDA	<u>Rawinsonde</u> 5. Final data, 5-s average meteorological parameters. 6. Final 10-mb data. 7. Final 50-mb data. 8. Adiabatic charts and listings. 9. Original calibration documents. 12. Prefinal (5 s, 10 mb, 50 mb)	Mag. tape Mag. tape Mag. tape Microfilm Microfilm Mag. tape
200	NCC/NOAA	<u>Standard Data</u> Hourly surface observations.	Mag. tape

Table 9.--Summary of data available from final
IFYGL Archive: United States (Cont'd)

TASK NO.	INVESTIGATOR	DESCRIPTION OF DATA	MEDIA
	<u>PANEL</u>	<u>MAJOR U.S. IFYGL SYSTEMS (Cont'd)</u>	
261	NOAA	<u>Lake Data</u>	
		1. Monthly bulletin of lake levels, April 1972 - September 1973.	Report
		2. Great Lakes water levels: 1970, 1971, 1860-1970.	Report
280		<u>Other</u>	
		1. Aerial photographs of Rochester.	Prints
		2. ERIM viewgraphs (T45-46-47).	Film
	<u>PANEL</u>	<u>TERRESTRIAL WATER BALANCE</u>	
23	Cox	<u>Outflow Term</u>	
		1. Discharge St. Lawrence River.	Mag. Tape
		2. Final report/data report.	Microfiche
30	Wilshaw	<u>Lake Water Level Gages - U.S.</u>	
		4. Edited (converted to common datum) hourly water levels.	Mag. tape
39	Peck	<u>Airborne Snow Reconnaissance</u>	
		2. Ground truth data.	Microfiche
		3. Airborne survey water equivalent.	Microfiche
		4. Soil moisture measurements.	Microfiche
		5. Snowcover water equivalents.	Microfiche
		6. Water equivalent from airborne survey.	Microfiche
45	Polcyn	<u>Remote Sensing</u>	
		7. Aircraft flight data record.	Pages
48	Quinn	<u>Lake Survey Center Precipitation Gage Network</u>	
		2. Hourly precipitation amounts.	Mag. tape
		4. Daily Lake Ontario basin precipitation.	Microfiche

Table 9.--Summary of data available from final
IFYGL Archive: United States (Cont'd)

TASK NO.	INVESTIGATOR	DESCRIPTION OF DATA	MEDIA
	<u>PANEL</u>	<u>TERRESTRIAL WATER BALANCE</u> (Cont'd)	
58	Schultz	<u>Runoff</u>	
		4. Weekly data.	Cards
		5. Weekly data.	Microfiche
		6. Tributary stage and discharge.	Microfiche
69	Wilson	<u>Radar and Precipitation Gage Network</u>	
		7. Raw precipitation data: Rochester precipitation network.	Punched paper tape
		10. Precipitation data: Rochester precipitation network.	Mag. tape
		13. Daily precipitation estimates.	Pages
70	Wiesnet/ McGinnis	<u>Aerial Hydrological Survey</u>	
		1. NASA U2 photography - 6 overflights.	70-mm film
74	Sykes	<u>Snow Observation Network</u>	
		6. Oswego area weather radar project, 1972/1973.	Microfiche
	<u>PANEL</u>	<u>WATER MOVEMENT</u>	
27	Liu	<u>Waverider Buoy</u>	
		5. Hourly summary and plot of digitized wave data.	Microfilm
59	Scott	<u>Coastal Chain</u>	
		1. Current/water temperature.	Mag. tape
		2. Final and basic data report.	Microfiche
		3. Current/water temperature.	Cards

Table 10.--Summary of data available from final
IFYGL Archive: Canada

TASK NO.	INVESTIGATOR	DESCRIPTION OF DATA	MEDIA
	<u>PANEL</u>	<u>ATMOSPHERIC BOUNDARY LAYER</u>	
15BL	McBean/ Morrissey	<u>Space Spectra in the Free Atmosphere</u>	
	1-2.	Mesoscale meteorological data provided by low-level research flights.	Report Mag. tape
28BL	McBean	<u>Momentum, Heat, and Moisture Transfer</u>	
		Micrometeorological program.	Report
44BL	Elder	<u>Analysis of Energy Fluxes By Aerodynamic Methods</u>	
	2.	First estimates - energy flux.	Papers
	4.	Preliminary investigation of wind stress field over Lake Ontario.	Report
75BL	Smith	<u>Wind and Temperature Fluctuations</u>	
	1.	Niagara Bar west mast wind and temperature fluctuations, June 1972	Report
	2.	Niagara Bar center mast wind, temperature, and humidity fluctuations, June 1972 final data.	Report
	3.	Bedford buoy #1 wind and temperature fluctuations, October 1972.	Report
97BL	Elder	<u>Meteorological Buoy Measurements</u>	
	1.	Canadian buoy network: 10-min observational data.	Mag. tape Report
	3.	Field report.	
	4.	Summary of meteorological buoy and manual measurements.	Report
107BL	Shaw/ Whelpdale	<u>Air Pollution Sinks</u>	
		Sulphate deposition by precipitation.	Report

Table 10.--Summary of data available from final
IFYGL Archive: Canada (Cont'd)

TASK NO.	INVESTIGATOR	DESCRIPTION OF DATA	MEDIA
	<u>PANEL</u>	<u>BIOLOGY - CHEMISTRY</u>	
54BC	Gorman	<u>Groundwater Supply Near Kingston</u> "A Geochemical Study of Deadman Bay Near Kingston, Eastern Ontario," by Laura M. Johnston.	Report
81BC	Salbach	<u>Material Balance Lake Ontario</u> Inland water quality monitoring program (preliminary).	Printout
82BC	Watson	<u>Lake Ontario Zooplankton Migration</u> "Energetics of Vertical Migration in Mysis relicta Loven, 1862" (Crustacea, Mysidacea), by James B. Foulds.	Report
83BC	Christie	<u>Cooperative Studies of Fish Stocks</u> DECCA readings: trawl drags.	Papers
86BC	Nicholson	<u>Lake Ontario Surface Plankton Survey</u> Pigment analysis: chlorophyll "A".	Report
101BC	Glooschenko	<u>Lake Ontario Primary Production Study</u> 1. "Primary Production at an Inshore and Offshore Station on Lake Ontario During IFYGL," by P. Stadelmann and J. Moore. 2. Measurement and prediction: offshore station.	Report Paper
	<u>PANEL</u>	<u>ENERGY BALANCE</u>	
8EB	Robertson	<u>Shore Gauging Stations</u> Hourly averaged water temperature from Oshawa, Kingston, Pt. Petre, Cobourg, Toronto, and Burlington.	Punched cards

Table 10.--Summary of data available from final
IFYGL Archive: Canada (Cont'd)

TASK NO.	INVESTIGATOR	DESCRIPTION OF DATA	MEDIA
	<u>PANEL</u>	<u>ENERGY BALANCE (Cont'd)</u>	
42EB	Boyce	<u>Heat Storage of Lake Ontario</u>	
	1-10.	Heat content survey of Lake Ontario, 1972: reports 1-10.	Report
71EB	Latimer	<u>Canadian Radiation Network</u>	
		Basic IFYGL installations.	Papers
72EB	Ramseier	<u>Floating Ice Research</u>	
		Navigation season extension studies, Gulf of St. Lawrence to Great Lakes, winter 1972-1973.	Report
80EB	Davies	<u>Radiation Balance Program</u>	
	1.	Solar radiation - read programs.	Punched cards
	2.	Radiation measurements and surface radiation balance estimates - final report.	Report
	<u>PANEL</u>	<u>FIELD SUPPORT</u>	
1F	Thomson	<u>Remote Sensing</u>	
		"Lake Dynamics Utilizing Sun-Glint," by R.P. Bukata and W.D. McColl.	Manual record
30F	Rodgers	<u>IFYGL Operations - CCGS Porte Dauphine</u>	
	1.	Temperature EBT.	Punched cards
	2.	Shipboard data.	Microfilm
68F	CCIW	<u>CCIW Supporting Resources</u>	
	1.	Shipboard data.	Mag. tape
	2.	TSAR.	Report
	3.	Shipboard data.	Punched cards
	4.	STAR monitor layout.	Report
	5.	Shipboard data.	Microfilm
	6.	Provisional listings, water quality monitoring program.	Paper

Table 10.--Summary of data available from final
IFYGL Archive: Canada (Cont'd)

TASK NO.	INVESTIGATOR	DESCRIPTION OF DATA	MEDIA
	<u>PANEL</u>	<u>FIELD SUPPORT</u> (Cont'd)	
79F	McCulloch	<u>Bathymetric Surveys - Lake Ontario</u> Lake Ontario bathymetric data.	Mag. tape
94F	McPhail	<u>Data Retransmission by Satellites</u> Data retransmission.	Report
118F	IFYGL	<u>General Publications</u> 1. Plan of study for IFYGL. 2. Surface pressure objective analysis scheme. 3. Numerical models of airflow above Lake Ontario. 4. IFYGL-1971 deep water buoy intercomparison. 5. Canadian Projects 1-4. 6. Canadian IFYGL projects data submissions - 7/31/74.	Report Report Report Report Report Report
250	IFYGL	<u>Monthly Summary</u> IFYGL "weather data" monthly summary.	Report
	<u>PANEL</u>	<u>LAKE METEOROLOGY AND EVAPORATION</u>	
16ME	Irbe	<u>Airborne Radiation Thermometer Surveys</u> Airborne radiation thermometer maps of Lake Ontario.	Charts
18ME	McCulloch	<u>Climatological Network</u> Monthly record of Canadian meteorological ship data (1972): all lakes.	Reports and mag. tape
24ME	Phillips	<u>Climatological Studies</u> IFYGL weather highlights.	Report
25ME	Irbe	<u>Lake Ontario Evaporation by Mass Temperature</u> Monthly evaporation estimates.	Report

Table 10.--Summary of data available from final
IFYGL Archive: Canada (Cont'd)

TASK NO.	INVESTIGATOR	DESCRIPTION OF DATA	MEDIA
	<u>PANEL</u>	<u>LAKE METEOROLOGY AND EVAPORATION</u> (Cont'd)	
65ME	McCulloch	<u>Evaporation Pan Network</u>	
		Evaporation pan documentation.	Papers
67ME	Webb	<u>Surface-Water Temperature Distribution</u>	
		Mean monthly temperatures of Lake Ontario.	Report
117ME	McCulloch	<u>APT Photographs</u>	
		WX-satellite APT photos, 4/1/72-6/30/73.	Microfilm
	<u>Panel</u>	<u>TERRESTRIAL WATER BALANCE</u>	
12TW	Witherspoon	<u>Monthly Water Balance of Lake Ontario</u>	
		Preliminary report on estimates of water balance for IFYGL.	Report
13TW	Ryckborst	<u>Groundwater Flow Into Lake Ontario</u>	
		1. "Regional Groundwater Flow Between Lake Simcoe and Lake Ontario," by C.J. Haefeli.	Report
		2. "Groundwater Inflow Into Lake Ontario From the Canadian Side," by C.J. Haefeli.	Report
14TW	Russell	<u>Hydrology of Lake Ontario</u>	
		1. Summary of discharge data for 37 stations.	Punched cards and paper
		2. Formats for discharge data.	Report
38TW	Ostey	<u>Groundwater Contribution to Lake Ontario</u>	
		1. Overburden well yields.	Maps
		2. Hydrology of Forty Mile Creek.	Report
		3. Bedrock well yields.	Maps
		4. Groundwater chemistry - Forty Mile Creek.	Report
		5. Surficial geology Bowmenville-New Castle.	Report

Table 10.--Summary of data available from final
IFYGL Archive: Canada (Cont'd)

TASK NO.	INVESTIGATOR	DESCRIPTION OF DATA	MEDIA
	<u>PANEL</u>	<u>TERRESTRIAL WATER BALANCE (Cont'd)</u>	
49TW	Adams	<u>Snow Stratigraphy and Distribution</u>	
		1. Progress report.	Report
		2. Peterborough area: snow stratigraphy and distribution.	Report
74TW	Dohler	<u>Water Level Network</u>	
		1-6. Water level data for Port Weller, Toronto, Burlington, Cobourg, Point Petre, and Kingston.	Punched cards
		7. Water level formats.	Papers
		8. Water levels.	Mag. tape
108TW	Dohler	<u>Lake Level Transfer</u>	
		Water levels.	List
116TW	Loijens	<u>Airborne Gamma-Ray Snow Survey</u>	
		Gamma-ray spectrometer snow survey.	Paper
	<u>PANEL</u>	<u>WATER MOVEMENTS</u>	
45WM	Bennett	<u>Lake Current Measurements</u>	
		1. Header information for 10-min current flow and temperature data from CCIW moorings.	Manual records
		2. 10-min current flow and temperature data from CCIW moorings.	Mag. tape

